

MEMO

May 22, 2007

To: David Burch and David Vintze, BAAQMD

From: William Hurrell, WSA

Subject: Cruising Technical Memorandum

INTRODUCTION

Cruising for on-street parking has adverse effects on traffic flow and air quality, and increases the friction between vehicles and pedestrians. However, it has been very difficult to measure the extent of cruising, since the drivers' motives are unknown except through extensive interviews and surveys. Various methods to measure the extent of cruising have been implemented, and each has its own strengths and weaknesses.

For one of MTC's case studies in downtown Berkeley, the Wilbur Smith Associates (WSA) project team was tasked to estimate the extent of cruising in the City of Berkeley's busy downtown area during a typical weekday. The Berkeley downtown area is roughly bounded by University Avenue in the north, Milvia Street in the west, Oxford Street in the east, and Channing Way in the south. At the heart of this area is Shattuck Avenue, a major commercial street running north-south.

This technical memorandum provides data collection methodologies to estimate the extent of cruising in downtown Berkeley, and the resulting data, conclusions, and lessons-learned.

DATA COLLECTION METHODOLOGIES

Video Data Methodology

After carefully considering the different methods against the project's goals, objectives, and resources, the project team selected Donald Shoup's methodology as detailed in his publication *The High Price of Free Parking*. In it, Shoup and his team counted the number of vehicles passing a vacant parking stall until one parks there. For example, if four cars pass a vacant stall while the fifth stopped and claimed it, one could estimate that one out of five (20 percent) of the vehicles were cruising for parking, while the rest were not interested in the vacant space, and therefore, were not cruising. This is considered one cruising "occurrence."

To be able to capture the largest sample size for this analysis, the project team had to videotape a downtown block from a higher vantage point, looking down to the street below. The team worked together with the City of Berkeley and the Downtown Berkeley Association in securing access to multi-story buildings in the study area. The project team decided to collect data from the 7th story balcony of the Gaia Building (pictured above), located on 2120



Allston Way, overlooking Allston Way. This block consisted of metered parking spaces along both sides of the street. To the west, this block was bounded by Shattuck Avenue, while to the east is Oxford Street. Two cameras were placed on tripods; one camera faced the west, while the other camera faced the east.

The data collection effort did not target a specific sample size of occurrences; instead, video data were collected for the entire day, which allowed the project team to observe parking demand/cruising patterns over time. To ensure that the data were statistically typical, the project team ensured that the data collection effort was performed on a typical weekday, and avoided events that could skew the results (i.e., holidays, street sweeping days, major construction closure, etc.)

The project team collected video data on Wednesday, January 31, 2007. It was a typical weekday with no street cleaning scheduled, and the weather was clear for the entire day. The video data were collected between 10AM and 7PM.

The following are the detailed data collection steps:

1. Prior to data collection, the project team contacted the City of Berkeley for support and leads on tenants in the downtown area who might be interested in helping study the parking situation in their neighborhood.
2. Based on these leads, the project team started scouting the study area for possible vantage points, then approached the Downtown Berkeley Association and prospective tenants/landlords for their assistance.
3. The project team selected the Gaia Building on 2120 Allston Way in downtown Berkeley, between Shattuck Avenue and Oxford Street as a vantage point. The video cameras were set up on the 7th floor balcony, overlooking Allston Way. The landlord agreed to provide access to the balcony and electricity to power up the video cameras.
4. One camera was set up to face the east, and the other faced the west from the same vantage point. The one facing east was able to capture 10 parking spaces within its field of view, while the other captured nine parking spaces.
5. The video images were stored in mini-DV tapes, each containing 90-minutes of uninterrupted video. The images were recorded under the LP (long play) setting. During data collection, less than one minute of lost time was experienced each time the tapes were switched, and any parking maneuvers occurring during the switch were documented. The two camera clocks were synchronized prior to data collection.
6. Data collection was performed during a typical weekday, between 10AM and 7PM. The equipment was set up at 9AM, and the tear down was finished by 8PM.
7. The 7th floor balcony was a common area accessible to tenants and guests, so for security and data integrity reasons, a staff member was present at all times during the data collection period. The consultant was also responsible for the set up/tear down of the equipment, as well as switching the tapes every 90 minutes.
8. Once collected, the project team converted the images from mini-DV to pure digital files, in Windows Media Video (WMV) format.

9. The project team then analyzed the video data by counting the number of vehicles passing a vacant parking space until a car occupied it (as explained previously). The analysis was performed for both eastbound and westbound movements.
10. The estimated percentage of drivers cruising for parking was calculated as follows:

$$\frac{\text{CarsOccupyingVacantSpace}}{\text{PassingCars} + \text{CarsOccupyingVacantSpace}}$$

Self-Cruising Methodology

This data collection effort determines how much extra time and distance are typically required when cruising occurs. The study area for this methodology encompassed the southern half of downtown Berkeley, bounded by Kittredge Street, Oxford Street, Milvia Street, and Channing Way. Based on initial scouting of the area, the southern half of downtown Berkeley consisted of mostly metered parking spaces, where cruising was typically evident.

As with the video data collection effort, this data collection also took place on Wednesday, January 31, 2007. The data collection effort occurred between 10AM and 6PM. This data collection study area was intentionally separated from the video collection, to avoid possible data contamination from each other.

In this method, four staff consultants in four vehicles were stationed at the entrances of the study area. Every 30 minutes, each driver entered the study area from predetermined starting points and attempted to park at their predetermined destinations. The destinations included a variety of land uses, at different locations within the study area. The project team hoped that different cruising patterns would emerge based on the location and land use of the target destinations. The origins and destinations were as follows:

1. From Shattuck Avenue/Allston Way intersection to the Berkeley Public Library, at 2090 Kittredge Street;
2. From Shattuck Avenue/Allston Way intersection to an office building at 2105 Bancroft Way;
3. From Shattuck Avenue/Haste Street intersection to a Citibank branch, at 2323 Shattuck Ave; and
4. From Shattuck Avenue/Haste Street intersection to a residential building at 2019 Channing Way.

The goal of each driver was to find a parking space within 100 feet of the target destinations. This translated to about ten diagonal parking spaces or six parallel parking spaces away from the target's front entrance. Any extra time and distance required to find parking was considered cruising. The drivers were equipped with stopwatches, which were activated once he/she realized that there were no parking spaces within the target destination's range. The vehicle's odometer was used to record the extra distance traveled during cruising, which was recorded in 0.1-mile increments.

The following are the detailed data collection steps:

1. Every 30 minutes, each driver started from their starting intersections, and approached their predetermined target destination. They attempted to park within 100 feet of the target's front entrance (ten diagonal parking spaces or six parallel parking spaces away). To arrive to their target destinations, the team members were permitted to use different routes. If they approached the destination, and the target destination was on the opposite side (left side) of the vehicle, they were

- only allowed to look for parking spaces on their side (right side) of the street, but still within 100 feet. Otherwise, they must accept the “next-best” options (they are defined further below).
2. When parking was found immediately, there was no cruising. They must safely park their vehicles, and noted “No Cruising” (NC) for this particular time slot.
 3. When parking was not immediately found within the target’s range, cruising was present. The stopwatch and odometer were activated after the driver completed a visual sweep of the parking area and realized that there were no available parking spaces within the predetermined range of the target. The stopwatch was stopped once the car occupied the next-best available space, and the car was safely parked. The driver then noted the time shown on the stopwatch, and also noted the extra distance required. Since most odometers only record up to 0.1-mile increments, recordings were rounded up for distances less than 0.1 miles, unless someone was about to vacate a parking space and the driver decided to wait for that space.
 4. The “next-best” parking options were defined as follows, in order of preference:
 - a. An empty parking space outside the predetermined range (beyond 100 feet, or ten diagonal parking spaces or six parallel parking spaces). In this case, the distance traveled would be higher, but the extra time would be shorter;
 - b. Waiting for a car to vacate a parking space within the range of the target’s front entrance. Here, the cruising time would be higher, but with no extra distance covered;
 - c. A parking space anywhere within the study area. In this case, both extra time and distance would be required;
 - d. A parking space outside the study area. If the area was extremely busy, the driver might be forced to find a parking space outside of the study area; or
 - e. After 20 minutes of cruising for parking, the driver must stop at a safe place, and write “MAX” under time spent. They were to record all observations that they might find pertinent, such as final location after 20 minutes of cruising, their approximate search area, and probable factors contributing to this.
 5. Some assumptions used in this effort:
 - a. For the purpose of this study, off-street parking spaces did not count. Each driver must cruise until an on-street parking space was found; and
 - b. The drivers were free to choose their preferred cruising methods, but they were asked to be consistent in their methods. For example, some might prefer cruising slowly and waited for someone to vacate a parking space, while others might prefer circling the block just once before heading to the less-busy blocks for parking.
 6. Safety was a very important element during the course of this data collection, both for the project team members and other motorists in the area. Project team members were directed to take notes only after parking was found, and to follow the rules of the road. For example, they could not perform a U-turn maneuver to claim a vacant parking space in the opposite traffic direction, or park illegally. In this regard, the data collection effort was designed to be more conservative than a more typical cruising activity. They were also prohibited from making phone calls while driving.

DATA COLLECTION RESULTS

Video Data Results

The following Table 1 summarizes the results of the video survey. Parking activities from 19 parking spaces were captured by both video cameras. To maximize continuous flow of data throughout the data collection period, the video data were categorized into six-1½ hour periods, following the maximum recording capacity of each mini-DV tape.

For each time period, the numbers of “Parking Occurrences” were recorded, or the number of spaces being vacated or available during data collection. This included spaces that were available at the beginning of the data collection period (10AM), or spaces that became available afterwards. For each vacant space, the number vehicles passing them were recorded as “Passing Vehicles” in the table. The sums of the passing cars and the one that finally claimed the spaces are shown in the “Cars Passing + Parking” column.

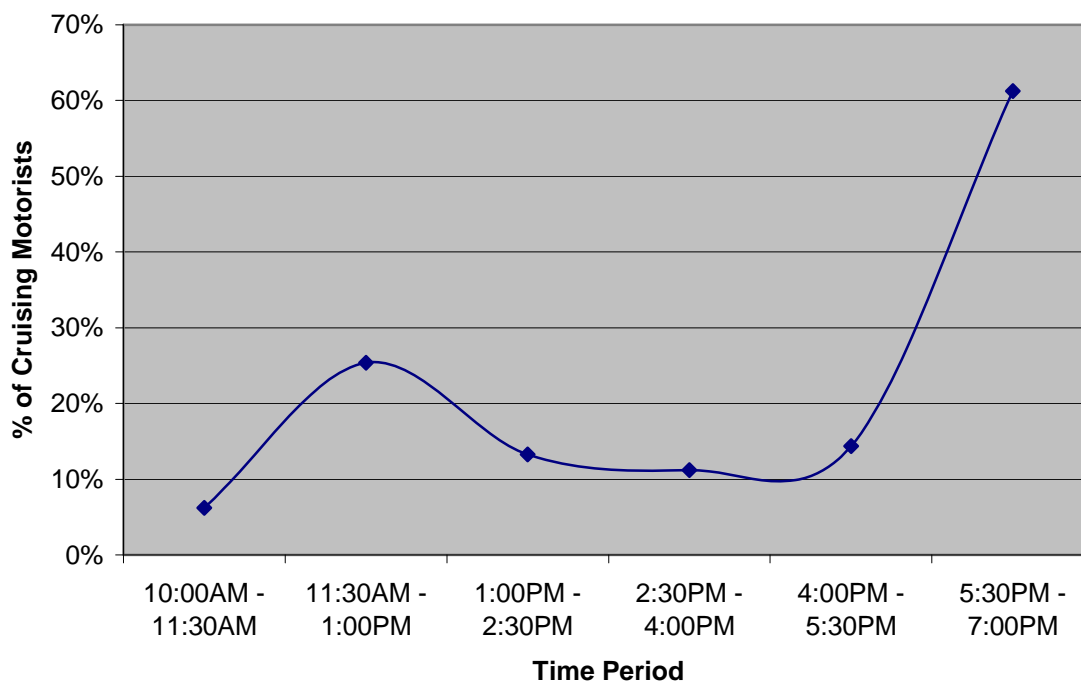
The extent of cruising for this block was estimated to range between six and sixty percent, depending on the time period. For the entire day, the block averaged a 13 percent cruising rate. During the morning period, for example, there was little evidence cruising; as 32 parking spaces were either available or vacated between 10AM and 11:30AM, and 484 vehicles were observed passing them. Here, cruising was estimated to be 6.2 percent (32 vacant spaces / (484 “not interested” vehicles + 32 “interested” vehicles) = 6.2 percent “cruisers”). Around noon, between 11:30AM and 1PM, cruising quadrupled to about 25 percent, as people visited downtown Berkeley for lunch. Cruising again went down during the afternoon hours, and picked up pace again just before 6PM, when parking became free and once again visitors came for dinner and after-hours activities. In the evening, there were 30 parking occurrences, but only 19 passing cars, which meant that most of the vacant spaces were immediately taken by the first vehicles on the scene. Figure 1 illustrates the extent of cruising resulting from the video data collection effort.

The extent of cruising followed observed parking demand patterns presented in a memorandum titled *Summary of Findings, MTC Case Study: Berkeley*, submitted in September 2006. Here, parking demand ramped up to 82 percent occupancy at 1PM, eased off slightly to 81 percent in the afternoon, before rising again to 85 percent (4PM), 86 percent (5PM), and finally 91 percent by 6PM.

Table 1
SUMMARY OF VIDEO DATA

Time Period	Parking Occurrence	Cars Passing	Cars Passing + Parking	% Cruising
10:00AM - 11:30AM	32	484	516	6.20%
11:30AM - 1:00PM	35	103	138	25.36%
1:00PM - 2:30PM	44	287	331	13.29%
2:30PM - 4:00PM	40	317	357	11.20%
4:00PM - 5:30PM	42	250	292	14.38%
5:30PM - 7:00PM	30	19	49	61.22%
TOTAL	223	1,460	1,683	13.25%

Figure 1
PERCENTAGE OF CRUISING MOTORISTS BY TIME OF DAY
ALLSTON WAY, BERKELEY, CA



It is worth noting that during data collection, the project team observed that there was one vehicle parking at one of the spaces since early morning, even before data collection began. This vehicle stayed for almost the entire day, although there were no construction signs present. It was possible that the vehicle had shown a disability tag, and was able to park for free, but no visual confirmation was made. The vehicle finally vacated the space in the late afternoon hours. This occurrence effectively reduced the number of observed spaces from 19 to 18 for most of the day, but should not significantly alter the results of the study. If anything, this anecdotal experience should support the perception that parking is a highly desired commodity in downtown Berkeley.

Self-Cruising Results

Table 2 summarizes the results of the self-cruising data collection effort. The project team observed that depending on the location, parking meter time limits, and time period, the extents of cruising varied heavily, and did not always conform to the pattern shown in the parking demand analysis (presented in September 2006) and the video data from Allston Way.

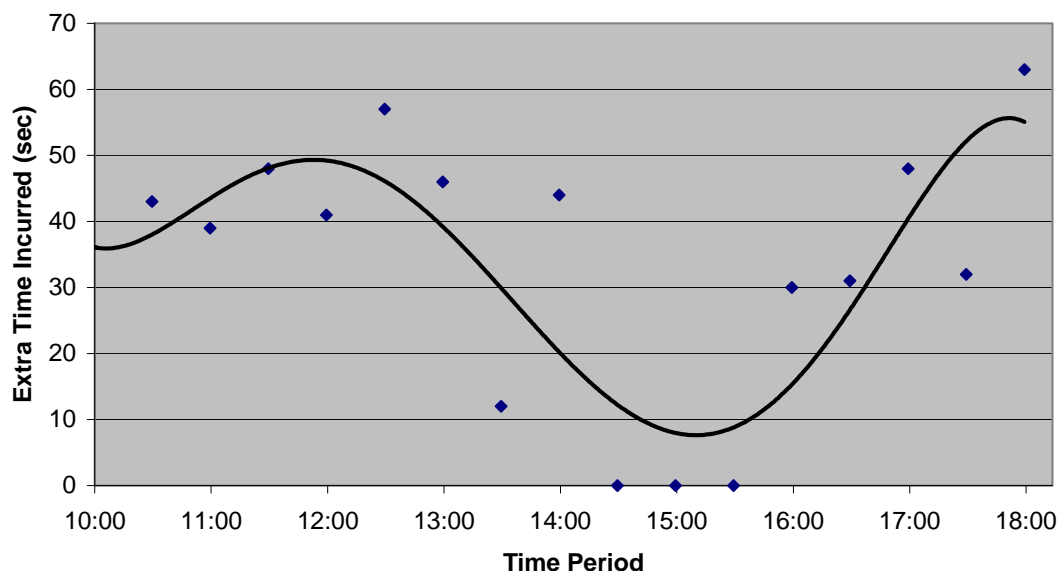
At the Berkeley Public Library (on Kittredge Street) for example, heavy cruising was observed both in the morning and afternoon hours, but not during lunchtime. The team noted that in fact, many 90-minute parking spaces were available right in front of the library at around noon. Otherwise, cruising extended between 29 seconds up to 184 seconds (over three minutes), covering additional distances of up to ½ miles. The team hypothesized that around lunchtime, many library patrons that parked near the library actually *left* the downtown Berkeley area by car, for lunch. As the library patron outflow exceeded the library patron inflow, parking spaces became available. And because the library is a strong parking demand generator for the area, not many motorists intending to visit elsewhere would park near the library. This is an interesting phenomenon, considering that the location of the library is in close proximities to other attractions in downtown Berkeley, such as City offices, retail stores, and restaurants.

On the other hand, there was hardly any cruising present at the office building on Bancroft Way. This area always had parking spaces available at one of the short-term (30-minute) stalls; however, the long-term (one- or two-hour) metered spaces were almost always occupied. Cruising was only present in one of the 17 time periods, and in nine of the 16 cases where parking was immediately found (no cruising), the driver ended up parking in a 30-minute space. The short time limit prompted higher parking turnover rates and thus, readily available spaces for short-term parking customers.

The Citibank on Shattuck showed intermittent cruising. While cruising was never prevalent here, parking availability was not consistent, and as such visitors may not feel they can regularly depend on this area for parking. The team also noted that parking enforcement was ever-present on Shattuck Avenue, which had a big impact in ensuring high parking turnover rates. In one late afternoon period, cruising time increased significantly to 82 seconds, although the extra distance covered remained low. This was largely caused by a surge of traffic on Shattuck Avenue, as parents drove into the area to pick up their children at Berkeley High School at around 3:45PM. The high school adjourns at 4:15PM daily.

Finally, the residential neighborhood on Channing Way showed consistent cruising throughout the day, although the range stayed under one minute, and the extra distance was limited to 0.1 miles. These spaces seemed to be constantly in demand throughout the day, with cruising present in 14 of the 17 time periods. Here, cruising ramped up between the morning and noon hours, and waned in the mid-afternoon, only to increase again in the late afternoon into the evening hours. The project team noted that when cruising for parking was necessary, there were always vacant metered parking spaces just one or two blocks away from this target. Figure 2 illustrates the extent of cruising pattern for this target destination, which followed the previously observed patterns from the video data and the parking demand analysis.

Figure 2
ADDITIONAL TIME SPENT CRUISING BY TIME OF DAY
CHANNING WAY, BERKELEY, CA



Overall, the Berkeley Public Library showed the highest extent of cruising, with an average of 66 extra seconds and 0.2 extra miles to the motorists. Next, the residential neighborhood on Channing Way on average incurred 33 additional seconds and 0.1 additional miles. The Citibank on Shattuck Avenue and the office building on Bancroft Way on average added 11 extra seconds and three extra seconds (respectively), with hardly any extra distance driven by the motorists.

Table 2
 SUMMARY OF SELF-CRUIISING DATA

Time Period	Berkeley Public Library		Offices on Bancroft		Citibank on Shattuck		Residential on Channing	
	Extra Time (sec)	Extra Dist (miles)	Extra Time (sec)	Extra Dist (miles)	Extra Time (sec)	Extra Dist (miles)	Extra Time (sec)	Extra Dist (miles)
10:00	184	0.5	0	0.0	0	0.0	35	0.1
10:30	139	0.1	0	0.0	0	0.0	43	0.1
11:00	30	0.1	0	0.0	0	0.0	39	0.1
11:30	142	0.5	0	0.0	0	0.0	48	0.1
12:00	0	0.0	0	0.0	10	0.1	41	0.1
12:30	0	0.0	0	0.0	0	0.0	57	0.1
13:00	0	0.0	57	0.1	8	0.1	46	0.1
13:30	0	0.0	0	0.0	11	0.1	12	0.1
14:00	92	0.3	0	0.0	0	0.0	44	0.1
14:30	29	0.1	0	0.0	15	0.1	0	0.0
15:00	58	0.1	0	0.0	0	0.0	0	0.0
15:30	61	0.1	0	0.0	82	0.1	0	0.0
16:00	95	0.1	0	0.0	0	0.0	30	0.1
16:30	0	0.0	0	0.0	0	0.0	31	0.1
17:00	142	0.3	0	0.0	0	0.0	48	0.1
17:30	67	0.2	0	0.0	0	0.0	32	0.1
18:00	77	0.2	0	0.0	68	0.1	63	0.1
AVERAGE	66	0.2	3	0.0	11	0.0	33	0.1

CONCLUSIONS

Combining the results of the video and the self-cruising data, the project team found that cruising in downtown Berkeley was highly driven by spatial and policy factors. Under normal circumstances, cruising followed the observed temporal patterns found in the parking demand analysis. Both parking demand and cruising peaked twice during the day, first at around noon, and second in the evening hours just before metered parking became free. The evening parking peak was always heavier than the noon peak (61 percent vs. 25 percent).

This pattern was exhibited by the Channing Way self-cruising data, as shown in Figure 2, and also by the video data, although the contrast between the two parking peaks were much more extreme (see Figure 1). This pattern was also shown to a lesser extent by the Citibank data. No cruising was present here in the morning, and there was mild cruising at around noon. As noted before, the bank, with its higher parking turnover rates, and the higher level of enforcement, contributed to the increased availability of parking. In the afternoon, cruising did not occur except for one time period just moments before Berkeley High School adjourned. Cruising occurred again in the evening and was observed to a much higher degree than the incidences observed around noon. Finally, the same pattern was exhibited to a lesser degree by the office building data where the only time cruising was present was at 1PM.

However, the project team found that spatial and policy factors played a major role; as parking time limits and land uses significantly affect the extent of cruising. The project team observed the following:

1. From the four different target destinations, the project team observed that cruising was more evident on the side streets of downtown Berkeley, where enforcement was less concentrated. Enforcement significantly increased parking turnover rates, and thus, reduced cruising.

2. Lower time limits helped eliminate cruising, but *only if* the motorists intended to stop for a very short time (30 minutes or less). Otherwise, too many short-term parking spaces could contribute to more cruising. Longer-term customers (intending to park for one to two hours) would ignore these spaces, creating a false impression of non-cruising, while in reality they were actually cruising for long-term metered spaces.
3. The team noted that since the downtown Berkeley area is quite small and dense, cruising mostly incurred additional time, but not much additional distances to the motorists. Hence, emission impacts attributed to cruising based on this study's observations would be similar to emissions caused by idling vehicles.
4. Strong parking demand generators could greatly affect cruising. For example, although the Berkeley Public Library's location is in close proximities to other significant destinations in the area, cruising patterns *in front of* the library was strictly defined by the parking demands generated *by* the library.

LESSONS LEARNED

From this data collection effort, the project team learned that cruising heavily depended upon local parking policies and land uses. The video data and the Channing Way self-cruising data were representative of the parking characteristics in downtown Berkeley's side streets, but as the team observed, a different level of enforcement could change the results dramatically. Likewise, unique major land uses such as the Berkeley Public Library, would be more likely to command their own parking demand and cruising patterns.

The project team learned that cruising would be best studied in smaller, more homogeneous environments. This is designed to minimize the variation in land use/parking demand, and thus, cruising patterns. The downtown Berkeley side streets were more homogeneous in this regard, and the project team observed parking demand patterns emerging more readily from the collected data.

On the other hand, the project team realized that the video and self-cruising data collection efforts assumed that all available parking spaces were equally attractive, while in fact they were not. These methodologies did not take into account the fact that different motorists would require different types of metered parking. Of course, a cruising study may be designed to target specific types of parking (i.e., ignoring all 30-minute spaces) to estimate cruising at these different turnover levels. However, intercept surveys would be needed to truly determine the proportions of long-term versus short-term visitors in this area, and the purpose of their trips.

PARKING POLICY IMPLICATIONS

It is very important to stress that the midday and evening cruising peaks happen to coincide with the highest parking occupancies observed in the Downtown Berkeley District. This has significant policy implications with regard to parking management. The following best practices parking management methods recommended in several individual MTC parking case studies would begin to mitigate the effects of cruising:

- Extending/shifting enforcement hours to cover peak (11AM to 8PM)
- Managing parking supply at peak demand
 - Market rate pricing by prime location
 - On/off-street pricing differentials
 - Wayfinding for off-street parking